

CLAIMS

1. A rotary assembly comprising a rotatable shaft; a sleeve journaled on the shaft and adapted to be stationary during rotation of the shaft; an earth vector sensor mounted for rotation with the shaft, the earth vector sensor being responsive to a given physical parameter in a direction substantially radial to the shaft; and an orientation signal generator which comprises means for generating a pulse train representing rotation of the shaft relative to the sleeve as a predetermined number of pulses per revolution, and means for deriving from the pulse train and the output of the earth vector sensor the angle between the earth vector and a given position on the sleeve.

2. A downhole assembly adapted to form part of a drill string and comprising a rotary assembly according to claim 1, and in which the earth vector is the component transverse to the drill string axis in the vicinity of the assembly of the earth's local magnetic field or gravitational field.

3. An assembly according to claim 1 or claim 2, in which the means for generating a pulse train comprises a directional sensor arranged radially of the shaft and cooperating with a plurality of elements equispaced around the circumference of the sleeve.

1 4. An assembly according to claim 3, in which said  
2 elements are ferromagnetic segments, and the sensor  
3 is a coil.

4

5 5. An assembly according to claim 4, in which the  
6 ferromagnetic elements are 24 in number.

7

8 6. An assembly according to claim 3, in which said  
9 deriving means operates to integrate the earth  
10 vector sensor output over each of a number of  
11 successive part-revolutions of the shaft to provide  
12 a series of simultaneous equations, and to solve  
13 these equations to provide an orientation angle for  
14 each of said plurality of elements with respect to  
15 the earth vector.

16

17 7. An assembly according to claim 6, in which said  
18 part-revolutions are quarter revolutions.

19

20 8. An assembly according to claim 6, in which said  
21 simultaneous equations are as defined in equations  
22 (vi) to (ix) above.

23

24 9. A downhole assembly according to claim 2, in  
25 which the sleeve forms part of a gamma ray detector,  
26 the sleeve being apertured to permit detection of  
27 gamma radiation strength transverse to the drill  
28 string axis.

29

30 10. A method of sensing the angular position of a  
31 rotary assembly which comprises a rotatable shaft  
32 and a sleeve journalled on the shaft and adapted to

09455-0344

1 be stationary during rotation of the shaft; the  
2 method comprising sensing an earth vector along an  
3 axis transverse to and rotating with the shaft,  
4 generating a pulse train representing rotation of  
5 the shaft relative to the sleeve as a predetermined  
6 number of pulses per revolution, and deriving from  
7 the pulse train and the earth vector the angle  
8 between the earth vector and a given position on the  
9 sleeve.